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Foras na Mara

Newport Research Facility

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Report for the year ended 31st December 2006

This report follows in sequence from the Annual Reports of the Salmon Research Agency of Ireland Inc. and the Salmon Research Trust of Ireland Inc.

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SUMMARY

1. The Salmon Research Agency of Ireland merged with the national Marine Institute on the 1st July 1999 into Aquaculture & Catchment Management Services. This report provides a continuation of the data records for the Burrishoole facilities.

2. The total rainfall recorded in Furnace was 1550.7 mm in 2006 – Months of relatively high rainfall in 2006 were March to May and September to December with low rainfall in June.

3. The total release of microtagged salmon smolts of Burrishoole reared origin into L. Furnace amounted to 27,273. Smolts were released as five groups, ranging in mean weight from 58g to 76g. A further 30,096 smolts were microtagged, freeze branded, and released as five 'experimental' groups.

4. A total of 364 (revised to 530) wild grilse were recorded moving upstream through the permanent traps during the season. The number of spring fish recorded in the upstream traps was 31. The total return of wild grilse, including the Lough Furnace rod catch (5), was 369 (revised to 535).

5. Returning adults were checked for net mark damage; the highest monthly incidence was 29% (n=184) of wild grilse and 51.3% (n=549) of reared grilse had net marks recorded.

6. A total of 7918 wild salmon smolts were recorded in the downstream trap in 2006. The wild grilse return of 2005 smolts was 5.2% (revised to 7.6%). The return to freshwater of the Burrishoole reared grilse recorded was 1.9%.

7. The maximum spawning escapement was 362 (revised to 520) wild fish and 32 reared fish

8. The ova to smolt survival was 0.64 - 0.56

9. A total of 38 wild sea trout and a further 61 non-silvered trout migrated upstream through the traps in 2006. Of the sea trout, 2 were adults and 36 (95%) were finnock. The 2006 smolt run amounted to 628 smolts.

10. The percentage of smolts returning as finnock in the same year has historically ranged from 11.4% to 32.4%. In 1989 it collapsed to a minimum of 1.5%. There has been a saw-tooth pattern of finnock return in the 1990's between 4 & 10%, rising to 16.7% in 1999 – the highest return rate since 1986. Finnock return in 2006 was at 5.8%.

11. Silver eel trapping continued with the total run amounting to 2163 with the run spread out in September, October and November.

12. A total of 114 salmon were caught in the Fishery in 2006. The catch consisted of 48 wild fish and 66 reared salmon. Of the 48 wild fish caught, 43 were returned alive to the water. There was a minimum of 11 sea trout caught on L. Furnace and returned alive.

13. Invertebrate surveys were carried out in 2006 on the Owengarve and Burrishoole catchments and these will be reported in the 2007 report.

1. INTRODUCTION

The Salmon Research Agency merged with the national Marine Institute on the 1st July 1999. The staff of the Agency were absorbed into the Aquaculture and Catchment Services group of the Institute and the research facilities at Furnace have undergone a programme of upgrading and improvement. The core monitoring work of the Agency will continue but its unique experimental facilities, both in relation to aquaculture and wild fisheries, will be fully utilised within the context of the Institutes published Research, Technology, Development and Innovation Strategy. The merger has resulted in an increased national role for the work of the Agency and a consolidation of the trap and laboratory facilities at Newport.

This report represents a continuation of the Annual Reports published by the Salmon Research Agency of Ireland. The data presented creates a unique record of fish rearing and wild fish census data for the past 37 years. This data is an essential component in the local, regional and national management of salmon, sea trout and eel and is becoming ever more valuable in the light of increasing pressures on natural stocks, such as exploitation, habitat degradation and global climate change scenarios. The fish monitoring facilities in Newport, along with the reared and ranched salmon stocks held in Burrishoole, are also essential for the evaluation of novel enhancement techniques, alternative stocks and ranching and evaluation of interactions between farmed, ranched and wild strains.

Photo: M. O'Grady

2 ENVIRONMENTAL DATA

2.1 Mill Race Data

Daily meteorological data were collected during 2006 at the manual Met Station in Furnace. The monthly rainfall figures for 2003 to 2006 are given in Table 2.1, along with the annual totals for the years 1977 to 2006. Months of relatively high rainfall in 2006 were March to May and September to December. Low rainfall was recorded in June. The total rainfall was 1550.7 mm in 2006.

Table 2.1. Monthly rainfall totals (mm) for the Furnace Station in 2003, 2004, 2005 and 2006 and the annual totals for 1977 to 2006.

Month	2003	2004	2005	2006	Year	Total
January	130.7	186.8	286.2	95.9	1977	1579.7
February	90.4	71.9	104.5	99.7	1978	1592.2
March	90.2	123.8	76.8	131.0	1979	1653.3
April	66.2	117.1	124.8	104.5	1980	1792.1
May	168.8	82.0	140.0	135.6	1981	1646.8
June	72.7	111.3	97.1	37.8	1982	1609.6
July	102.0	104.0	44.0	60.9	1983	1495.9
August	53.5	102.6	132.2	69.0	1984	1556.6
September	96.6	198.6	123.6	198.8	1985	1584.1
October	110.7	192.8	133.9	178.0	1986	1886.9
November	194.8	114.2	182.3	182.3	1987	1373.6
December	146.6	236.2	162.8	257.3	1988	1715.2
					1989	1583.9
					1990	1805.9
					1991	1549.6
					1992	1771.1
					1993	1473.4
					1994	1757.1
					1995	1382.5
					1996	1286.6
					1997	1351.6
					1998	1830.9
					1999	1949.1
					2000	1833.2
					2001	1298.7
					2002	1715.9
					2003	1353.2
					2004	1641.3
					2005	1608.2
					2006	1550.7

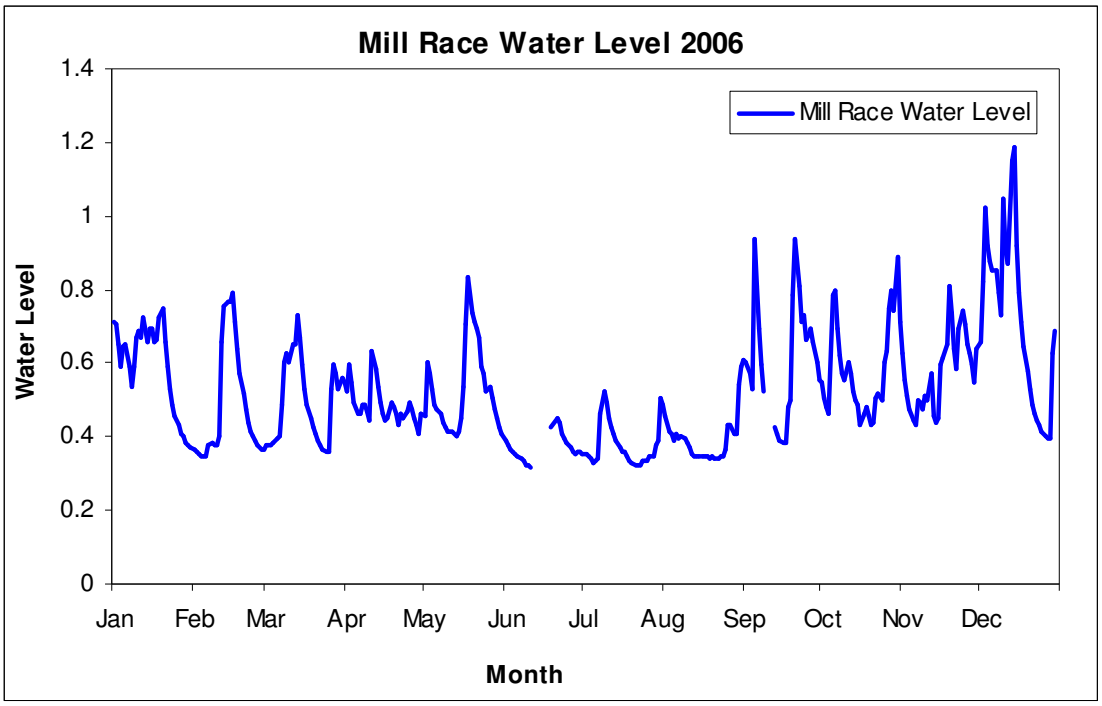


Fig. 2.1. Water levels recorded at mid-night for the Mill Race using an OTT Orphimedes automatic water level recorder.

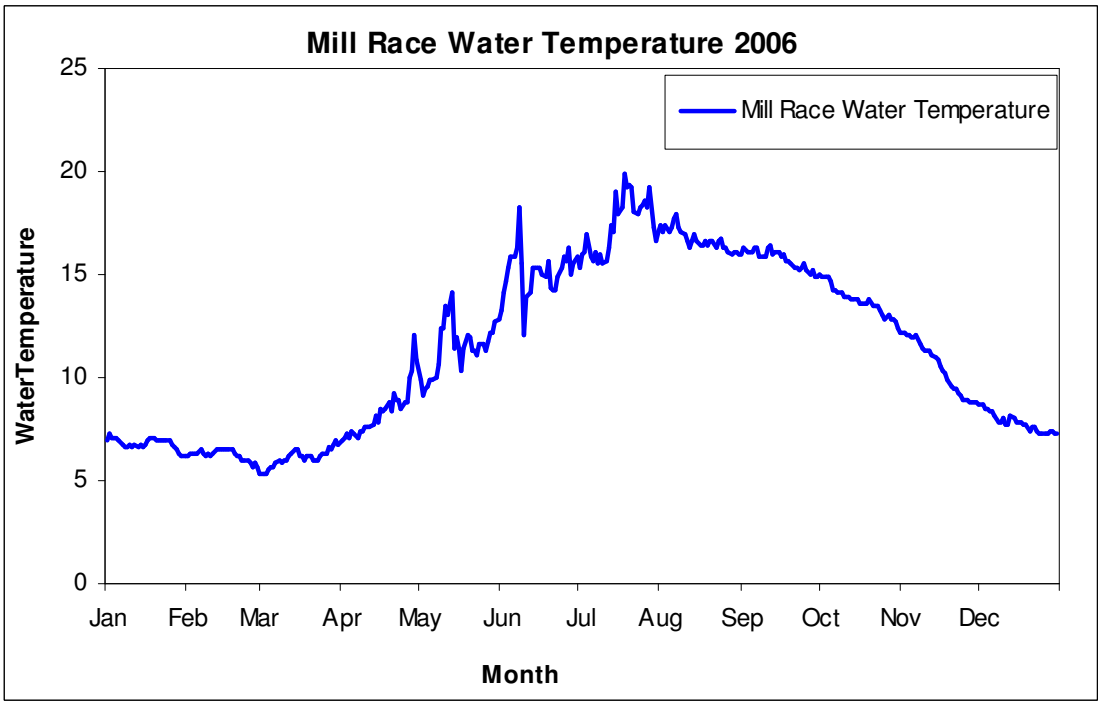


Fig. 2.2. Water temperatures recorded, by TidbiT data logger at mid-night for the Mill Race.

Water Level: Difficulties were experienced in 2003 with the automatic water level chart recorder. An OTT Orphimedes automatic water level recorder was installed in late January 2004. Water levels are recorded every 15 minutes and are presented in Figure 2.1 recorded at 23.45 hrs. This approximates to the previous mid-night readings from the chart recorder.

Water Temperature: In 2004, a TidbiT temperature logger was installed along with the chart recorder and this records water temperature every 30 minutes. The temperature logger data is presented in Figure 2.2, recorded at less than 30 minutes before midnight.

Water temperatures (recorded at midnight) fell to a minimum of 5.4^{o}C on the 1st March. There was a steady increase in temperature from early March through to May. A series of peaks occurred from May to mid-July, to maxima of 18.2 ^{o}C 8th June and 19.9 ^{o}C on the 18th July. Temperature began dropping steadily for the rest of the year from mid-September back to a minimum of 7.3 ^{o}C in late December. Temperature in December was over two degrees warmer than that in 2003 and similar to 2004 & 2005.

2.2 Catchment Programme

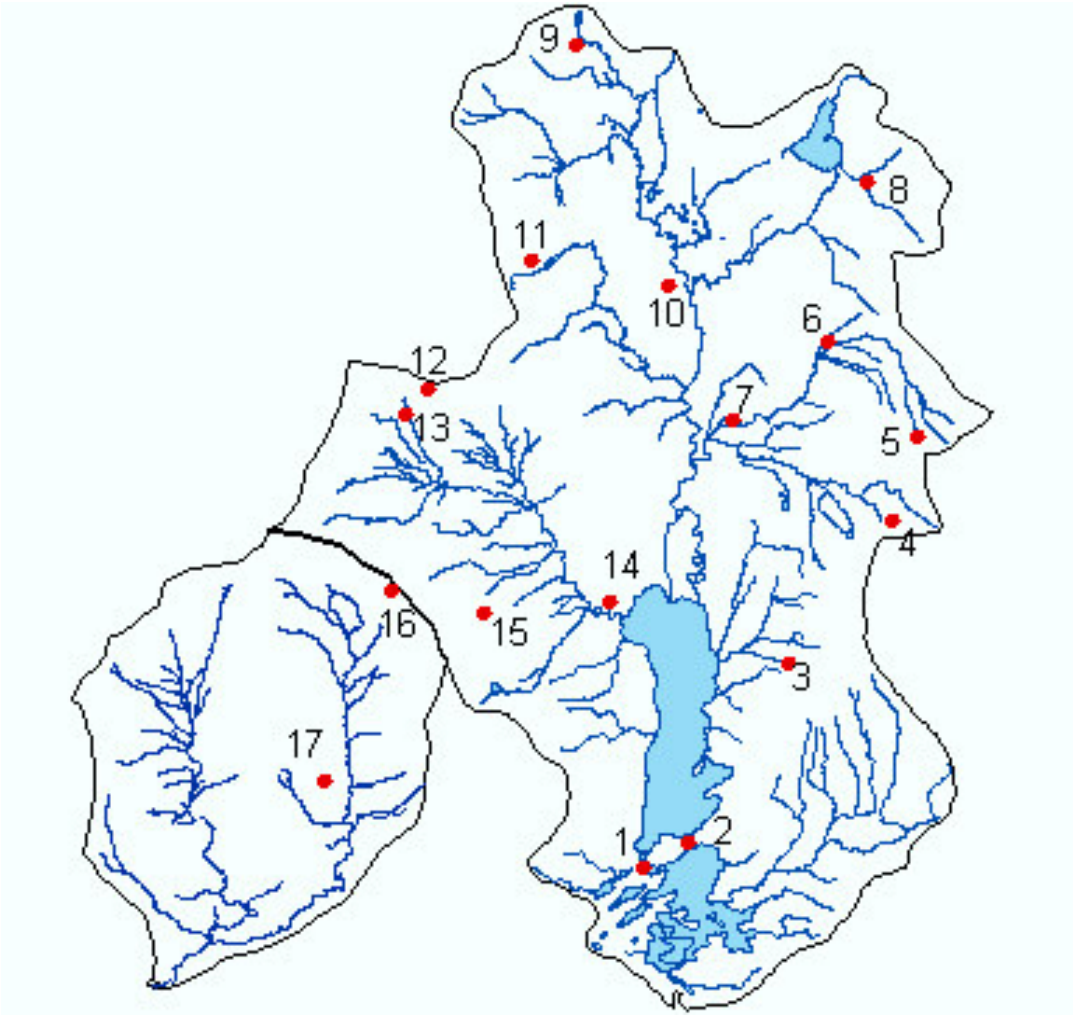
In recent years, the combined effects of extreme weather events, along with impacts of land use, have had a significant effect on the erosion rates recorded in many upland areas. Since 1995 the Marine Institute has operated a series of automatic monitoring stations to monitor these impacts, and to attempt to quantify the transport of suspended sediments in the Burrishoole catchment. These automatic stations, funded under EU LIFE and National programmes, include a lake station (AWQMS – installed under EU LIFE 93), which has various meteorological instruments included with a suite of underwater temperature and water chemistry sensors, and three river stations, (ARMS – installed under EU LIFE 98), which are equipped with sensors for measuring water temperature, water level, pH, conductivity, dissolved oxygen, and turbidity. The automatic monitoring stations are also equipped with a telemetry system for relaying high-resolution data back to the laboratory.

In addition the Institute has also deployed additional core-funded instrumentation in the catchment. These include seventeen data-logging rain gauges in the Burrishoole and Owengarve catchments (Figure 2.3) and two in the Owenduff catchment, which will assist in building up a detailed profile of precipitation in a mountainous catchment. Figure 2.5 shows annual total rainfall for the same stations for 2005. Even allowing for days when the gauges were not operating (Table 2.2), the data clearly show the considerable variation in recorded rainfall between locations within relatively short geographic distances.

Also deployed within the catchment are a series of OTT Orphimedes water level recorders which measure water level at fifteen-minute intervals. These data can be used to calculate water volumes on an hourly or daily basis. An important feature of the monitoring network is the ability to simultaneously collect data from river, lake, and climatic instruments. The continuing integration of this data with ongoing fish population surveys is an important component of the research programme.

Table 2.2 summarises rainfall for 19 rain gauges. The data include the maximum and mean daily rainfalls recorded at each site. The maximum figures recorded were 126.0 mm at the Goulaun gauge, 101.6 mm at Glenamong 2 and 103.0 mm at the Glenamong 4 gauge, all on

the 13th Dec 2006. These were considerably higher than the maxima recorded in 2005. Considerable variation in daily and annual rainfall was recorded between rain gauge sites. The table (Table 2.2) also notes the number of days each unit did not sample due to technical problems. Figure 2.4 shows the rainfall totals for the nineteen rain gauges.



1.	Salmon Leap	10.	Altahoney	19.	Glenadeegan
2.	Mill Race	11.	Maumaratta		
3.	Buckogh	12.	Glenamong 1		
4.	Lodge	13.	Glenamong 2		
5.	Srahrevagh 1	14.	Glenamong 3		
6.	Srahrevagh 2	15.	Glenamong 4		
7.	Srahrevagh 3	16.	Ridge		
8.	Gaulaun	17.	Glendahurk		
9.	Namaroon	18.	Tarsaghaun		

Figure 2.3. Rain gauge sites in the Burrishoole and Owengarve systems. 18 & 19 not on map.

Table 2.2. Summary rainfall data for 19 rain gauge stations in the Burrishoole, Owengarve and Owenduff catchments.

Date	sum	mean daily rainfall	blanks	Max	dry days	wet days
Altahoney	1728.6	5.7	62	64.4	83	220
Namaroon	2099.8	6.3	29	54.6	108	228
Buckogh	1732	4.7	0	50.4	108	257
Gaulaun	2090	5.7	1	126.0	73	291
Glenamong 1	806	4.3	177	25.6	39	149
Glenamong 2	1991	5.5	0	101.6	88	277
Glenamong 3	1839.4	5.0	0	52.8	99	266
Glenamong 4	2496.4	6.8	0	103.0	89	276
Glendahurk	1640.2	4.5	0	57.6	100	265
Ridge	601.6	2.2	89	87.6	105	172
Maumaratta	1984.2	5.4	0	67.8	81	284
Srahrevagh 1	1641.2	4.5	1	50.8	92	272
Srahrevagh 2	1130	3.2	10	23.6	91	264
Srahrevagh 3	1850.4	5.1	1	60.4	82	282
Lodge	1828.4	5.0	1	56.4	88	276
Salmon Leap	815.4	4.1	168	27.0	43	154
Mill Race	1364.8	3.7	0	26.6	91	274
Tarsaghaun	1148.8	4.7	123	40.2	53	189
Glenadeegan	470.4	3.6	233	32.2	34	98

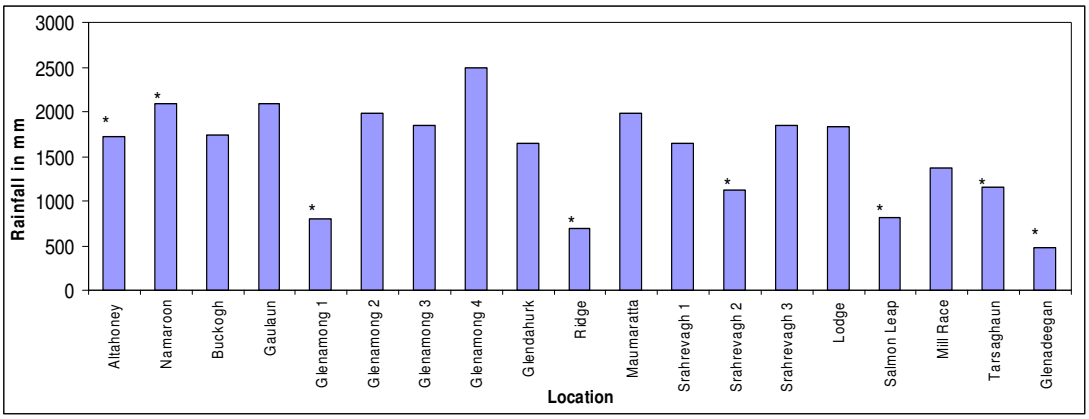


Figure 2.4. Rainfall totals for 19 rain gauge sites in the Burrishoole, Owengarve and Owenduff catchments for 2006. Asteriks mark incomplete data series (>1 day blank) – see Table 2.2.

3 SALMONID REARING

3.1 Salmon Stocks 2005

3.1.1 Ranching

The total release of microtagged smolts of ranched Burrishoole grilse origin into Lough Furnace was 27,273. Tag code details are shown in Section 5.4 (Reared Salmon Census: Smolt Releases 2006). Two core and three experimental groups of Burrishoole salmon smolts, comprising 6 tag codes, were released on 26th April and 4th May 2006. Mean weights ranged from 58 to 76 grams. Ongoing experimental programmes included the use of 'SLICE', to protect smolts against lice infestation during the first weeks at sea and thereby investigate if lice infestations are a significant factor in early marine mortality of Irish salmon smolts. This programme was extended to include three other hatcheries in 2006, on rivers Erne, Screebe and Lee. In addition, one group of salmon smolts was exposed to the SeaReady™ process, described in the 2005 Annual Report, to evaluate the ocean survival of matched control and SeaReady™ Atlantic salmon smolts.

A group of 7,989 microtagged and vaccinated (Norvac Compact 4) pre-smolts of ranched Burrishoole grilse origin, averaging 51gms, was released into the River Barrow at Clashgannyon, Co. Carlow on 6th April 2006, with a view to monitoring the distribution of grilse recoveries around the coast in 2007.

In addition to the Burrishoole ranch groups, 30,096 salmon smolts were released on 26th April 2006 as five experimental groups, which were differentially microtagged and branded (Table 3.1). Experimental groups were produced in December 2004 using Burrishoole wild, Burrishoole ranch and Owenmore parents. The study aims to compare the relative fitness of Burrishoole ranch and wild populations (in terms of culture and ranching) and also to investigate the performance of a non- native wild population (Owenmore).

Table 3.1. Details of five experimental groups, which were differentially microtagged and branded and released in 2006.

Group ID	Brand	Tag Code	Mean Wt.	Mean Length	No. Released
Ranch	X&O	24769	61.8 g	17.4 cm	6238
Ranch-Wild	X&O	24772	56.0 g	17.0 cm	6293
Wild	X&O	24788	55.6 g	16.9 cm	5634
Wild-Ranch	X&O	24787	56.9 g	17.0 cm	6271
Owenmore	T	24770	51.2 g	16.3 cm	5660

3.1.2 Aquaculture

An estimated 62,000 vaccinated (Norvac Compact 4) salmon smolts of Scottish origin, averaging 111g, were successfully transferred to a commercial sea farm (Connemara) in March 2006.

3.2 Salmon Stocks 2006

Burrishoole ranch, Burrishoole wild and commercial 2SW Scottish stocks were hatched in 2006. Growth and survival was satisfactory throughout the year and grading was carried out in July and August.

In 2006, a number of commercial salmon ova consignments, imported to Ireland from one source in Scotland, were found to be IPN positive. Consequently, it was necessary for several hatcheries to destroy this stock at the fry stage. Fortunately, the consignment received by MI was disease free and, in support of Industry, the stock was made available to a freshwater producer at the parr stage. An estimated 62,000 parr, ranging 25 to 40 gms, were transferred to a freshwater lake site on 28th and 29th September 2006.

Stocks remaining in December 2006 comprised 27,100 Burrishoole ranch, 5,900 Burrishoole wild and 25,600 surplus ranch stock.

3.3 Salmon Stocks 2007 (Grilse ova laid down in 2006)

Salmon broodstock were held in circular fibreglass tanks from early September and transferred to the broodstock holding pond on 20th October 06. Broodstock, totalling 306 adults (168 females, 138 males), were held during the stripping period from 5th December 06 to 9th January 07. The majority of microtags were read on the day of stripping and 4 female broodstock were identified as Shannon 2 SW salmon. Ova from these fish were excluded from the programme.

An estimated 391,000 green ova were produced by 118 Burrishoole hens. The average fecundity value was 3,387 per female. At the end of the stripping period on January 9th, 39 females remained, unready to strip (i.e. 24.8 % of females held). This was unusual and when females were examined, the egg sack membrane was found to be intact and in some cases a small number of over ripe ova were observed. As usual, a proportion of each family was retained in the hatchery from each of the six stripping dates, totalling 69,200 eyed ova. In addition 17,100 eyed ova were retained for other programmes.

Broodstock condition was good throughout the holding period, although formalin treatments were necessary during October and November. Fish were tested by the Marine Institute Fish Health Unit in December and subsequently salmon ova were certified disease free. Ova quality and survival was good.

The Marine Institute ACMS and earlier the Salmon Research Agency supplied eyed salmon from Burrishoole and other Irish ranch stocks to the 'Rhine Programme' in Germany from 1991 to 2005. Funding for this programme was no longer available in 2006.

3.4 Rainbow Trout 2006

An estimated 8,500 0+ rainbow trout (Seven Springs NI) were stocked into Ballinlough Fishery, from September to November 2006. Nineteen hundred trout were retained in December 2006 for stocking in 2007.

3.5 Sea lice vaccine research programme

In 2005, the Faculty of Veterinary Medicine UCD was awarded funding for the project ' Novel Vaccines for the Control of Sea Lice on Salmonids' through the NDP Marine RTDI Fund for collaborative research with the Aquaculture Section, ACMS. The objectives of this project are to identify and isolate novel sea lice vaccine candidates and to undertake studies that will identify parameters associated with immunological resistance to infection in vaccinated fish. The research programme consists of a number of work packages: identification of vaccine candidates, fish vaccination, sealice culture, infectivity trials and immunological studies. The fish production and vaccination components of this research programme will be carried out using freshwater rearing facilities in Furnace.

In March 2006, 800 salmon pre-smolts were vaccinated and branded to produce 5 groups, using 3 antigens. Vaccinated and control groups of salmon smolts were transferred to the Institute's experimental saltwater facilities in Galway on 3rd May, for infectivity trials. In November 2006, a further 1400 salmon parr were vaccinated and branded prior to exposure to lights for S ½ production. Seven groups were produced using combinations of 3 antigens and 2 adjuvants.

3.6 DIT Research programme

M.Sc. Studentship studies continued with Dublin Institute of Technology, to investigate biochemical changes in Atlantic salmon mucus proteins and their role during the smolting period.

DIT was awarded additional funding (Technological Sector Research: Strand 1) to continue proteomic research on Atlantic salmon during the smoltification period and the scope of the research was extended to include disease. Mr. Paul Dunne commenced research on this project in January 2006 as part of the Dublin Institute of Technology MPhil/PhD programme. Mucus samples were taken from ranch salmon during the smolting period from mid March to early May and wild salmon smolts were sampled once in May 2006.

3.7 Molecular biology of the Atlantic salmon

This research, funded by HEA PRTLI (2003-2006), aims to characterise gene expression profiles during the key life stages of Atlantic salmon, particularly smoltification and maturation, using functional genomics tools. In partnership with the Molecular Biology Group, National University of Ireland Galway, ACMS provided materials and services in support of this programme. Three postgraduate students continue to work towards completion of theses and publications. Five posters were presented by postgraduate students at the Plant and Animal Genome XIV Conference in San Diego, California 2006.

Denis Flynn completed his MSc.thesis 'Differential Gene Expression Analysis of the Wild Atlantic Salmon Brain during Precocity'.

4 SALMON CENSUS PROGRAMME

NOTE: In 2006 it became apparent that there was a problem related to the upstream count of reared and probably wild salmon. The number of reared salmon displaced downstream prior to the spawning season was higher than the number of fish released upstream and the majority of these displaced fish had not been previously floy tagged in the upstream trap. While it has been difficult to identify the source of the problem, it seems likely to have been isolated to the Mill Race and maybe due to a gap in the fish fence screens.

In this, and subsequent reports, the actual trap counts are presented as a minimum upstream count and the most likely scenario for an actual upstream count is also presented. How this was determined is included as an Annex to this report. For 2006, we used the average kelt survival to determine a revised upstream run (Scenario 3 in the Annex).

4.1 Wild Salmon and Grilse

A total of 364 wild grilse were recorded moving upstream through the permanent traps during the season (Table 4.1). The run commenced in May and was completed in December. The main upstream grilse migration was recorded in the Salmon Leap trap with 308 grilse, compared to 56 grilse in the Mill Race trap.

The total number of spring fish recorded in the upstream traps was 31.

The retained rod catch of wild grilse on Lough Furnace was 5 fish. Therefore, the total wild grilse return, including the Furnace rod catch and the upstream count, was **369** (the revised total return of **535** WG).

Table 4.1. Monthly wild grilse totals for the Salmon Leap and Mill Race traps.

	Mill Race	Salmon Leap	Total
May	0	2	2
June	2	3	5
July	18	128	146
August	17	99	116
September	13	70	83
October	3	6	9
November	2	0	2
December	1	0	1
Total	56	308	364

Note: the revised total count of **530** WG.

Table 4.2. Monthly proportions (%) of wild grilse run 2002 –'06.

	2002	2003	2004	2005	2006
May	0.9	0.9	0.0	0.4	0.5
June	53.4	10.7	36.0	23.9	1.4
July	32.3	49.8	41.0	13.2	40.1
August	7.3	11.4	9.8	39.1	31.9
September	0.3	8.6	10.9	14.8	22.8
October	4.9	10.8	1.0	5.5	2.5
November	0.6	7.7	0.7	3.0	0.5
December	0.3	0.0	0.5	0.2	0.3

Water levels were generally low for much of the summer season during 2006. The Salmon Leap trap was dry at the end of May and water levels were low until the beginning of July. The majority of the upstream migration in July was recorded over two days on the 9th and 10th of July. Water levels dropped off again and remained low until the end of July. Water levels were again low for much of August and increasing rainfall during the last week of August and the first week of September resulted in the main upstream migration of reared fish occurring during this period.

Table 4.3. Wild salmon and grilse totals in upstream traps 1970-2006

Year	Total Salmon	Total Grilse	
1970-74	14	1145	
1975-79	36	703	
1980-84	35	449	
1985-89	22	492	
1990-94	16	421	
1995	15	582	
1996	18	409	
1997	6	538	
1998	4	516	
1999	16	502	
2000	6	568	
2001	6	368	
2002	2	648	
2003	18	544	
2004	28	580	
2005	9	532	
2006	31	364	(revised to **530**)

Note: the revised total count of **530** WG.

4.2 Net marked fish in upstream traps

The highest monthly level of net marks recorded on wild fish was 29.1% and on reared fish was 51.3% (Table 4.4). This level of net marks was higher than in recent years, particularly in relation to reared. The low water conditions during the summer of 2006 may have resulted in fish being more prone to nets for a longer period than during wet summers.

Table 4.4. Percentage Occurrence of Net Marks on Wild and Reared Grilse

	Wild Grilse	Reared Grilse
May	0.0	0.0
June	0.0	0.0
July	25.7	15.8
August	29.1	50.3
September	13.7	51.3
October	0.0	40.6
November	0.0	0.0
December	0.0	0.0
Total		
	n = 184	n = 549

4.3 Wild Spawning Stock

The spawning stock represents the number of fish available for spawning. It is calculated by subtracting rod caught fish and downstream-displaced fish as well as losses due to poaching, disease and predation, which have been estimated at 5% for wild fish and 10% for reared fish.

It was noted in 2006 that the number of reared fish displaced downstream prior to the spawning season (139) was greater than the number of reared fish released upstream (102). The fact that only 16 reared fish were recorded as kelts would suggest that the majority of ranched fish had been displaced downstream prior to the spawning season. In 2006 the reared spawning component was calculated by assuming 50% mortality on the known kelt recovery of 16 fish, therefore the reared spawning stock is estimated at 32 fish.

In relation to the wild spawning stock, a total of 271 fish were recorded as kelts from an estimated spawning escapement of 363 fish. This is equivalent to a 75% survival to kelt which would suggest that some wild fish also moved upstream undetected.

The overall conclusion is that although both wild and reared fish migrated upstream undetected during 2006 the majority of reared fish were displaced downstream prior to spawning resulting in a low reared fish component in the spawning stock. It is likely that the recorded wild spawning stock is a minimum figure and this will have to be taken into consideration for all calculations based on the 2006 spawning escapement. The revised figure is 552 giving a wild spawning stock of 520 and 32 reared grilse.

Table 4.5. Spawning escapement 1970 - 2006

	Maximum spawning escapement	Wild fish component	Reared component
1970-74	1126	986	140
1975-79	725	683	42
1980-84	474	430	44
1985-89	662	428	232
1990-94	603	348	254
1995	464	376	102
1996	594	355	239
1997	494	466	28
1998	498	456	42
1999	547	485	62
2000	567	527	40
2001	370	349	21
2002	570	562	8
2003	517	506	11
2004	554	528	26
2005	503	472	31
2006	394 (552)	362 (520)	32*

* estimated from 16 kelts
Note: revised wild figure in brackets.

Table 4.6. Spawning stock of salmon and grilse (see below for revised table)

	Wild grilse(1SW) & previously spawned grilse	Wild Salmon (2SW)	Ranched fish released upstream
Counted in trap	364	31	102
Rod Feeagh*	--	--	--
Culled	1	--	0
Broodstock	0	--	0
Estimated morts.	18	2	0
Displacement	12	0	149
Spawning stock	**333**	**29**	**32**

* No angling on L. Feeagh during 2007

Table 4.6 Revised. Revised spawning stock of salmon and grilse

	Wild grilse(1SW) & previously spawned grilse	Wild Salmon (2SW)	Ranched fish released upstream
Counted in trap	530	31	181
Rod Feeagh*	--	--	--
Culled	1	--	0
Broodstock	0	--	0
Estimated morts.	26	2	0
Displacement	12	0	149
Spawning stock	**491**	**29**	**32**

4.4 Survival from Ova to Grilse

The relevant brood year for the 2006 grilse was 2002 with ova hatch in 2003 and smolt migration in 2005 (Table 4.7). As in previous years, it has been assumed for the purpose of estimating survival that ranched grilse spawned naturally. Specific data are not available on differential survival rates of wild and ranched stocks spawned in the wild. All relevant calculations are based on parameters set out in the Ann. Rep. No. 19, 1974.

Table 4.7. Survival from ova to grilse

Spawning escapement in 2002	570
No. of females	285 - 314
Ova deposition	1,140,000 – 1,290,053
No. of smolts in traps 2005	7261
No. of smolts released	7030
Survival ova to smolt	0.64 – 0.56
No. returning grilse 2006	369
Survival smolt to grilse	5.2%
Survival to grilse per grilse female	***1.2 – 1.3***
Revised figures	
No. returning grilse 2006	535
Survival smolt to grilse	7.6%
Survival to grilse per grilse female	***1.7 – 1.9***

4.5 Ova to Smolt Survival

The survival of ova to smolt ranged from 0.56 to 0.64 which was lower than the previous year.

The survival of smolt to grilse was 5.3% in 2006 although using the revised upstream count, the estimate marine survival from smolt to grilse was **7.6%.**

The survival to grilse per grilse female was 1.2 - 1.3 or revised to 1.7-1.9.

Table 4.8. Comparative data for the five-year averages from 1970 - 1989 and the values for the individual brood years, their subsequent smolts and grilse returns, from 1990 onwards.

Brood year-class	% survival rates ova to smolt	survival rates to grilse per grilse female spawner
1970-74	0.48 - 0.62	1.4 - 1.7
1975-79	0.63 - 0.73	1.5 - 1.7
1980-84	0.61 - 0.69	1.7 - 1.9
1985-89	0.44 - 0.45	1.4 - 1.5
1990	0.47 - 0.54	1.8 - 2.0
1991	0.47 - 0.53	1.8 - 2.0
1992	0.48 - 0.54	1.3 - 1.5
1993	0.39 - 0.45	1.5 - 1.6
1994	0.36 - 0.41	1.3 - 1.4
1995	0.83 - 0.93	1.9 - 2.1
1996	0.53 - 0.61	1.8 - 1.9
1997	0.52 - 0.59	1.4 - 1.5
1998	0.58 - 0.60	2.4 - 2.6
1999	0.79 - 0.70	1.8 - 2.0
2000	0.56 - 0.64	1.9 - 2.1
2001	1.30 - 1.10	2.9 - 2.6
2002	0.56 - 0.64	1.2 - 1.3 (1.7-1.9)

Note: revised figure in brackets

4.6 Wild Salmon Smolts

A total of 7918 wild salmon smolts were recorded in the downstream traps during 2006. This was an increase from 7261 recorded the previous year but lower than the 9316 smolts recorded in 2004.

The pattern of downstream migration of wild salmon smolts during 2006 was similar to the previous year in that it was spread over several weeks rather than having the distinctive peaks which are a more common feature in Burrishoole. The run commenced in the first week of April with the first peak occurring on the 27th of April. The run continued through May and the majority of the run was completed by the end of May. The main run of smolts was again in the Salmon Leap trap where 85% (6729) of the run was recorded compared to 15% (1189) in the Mill Race.

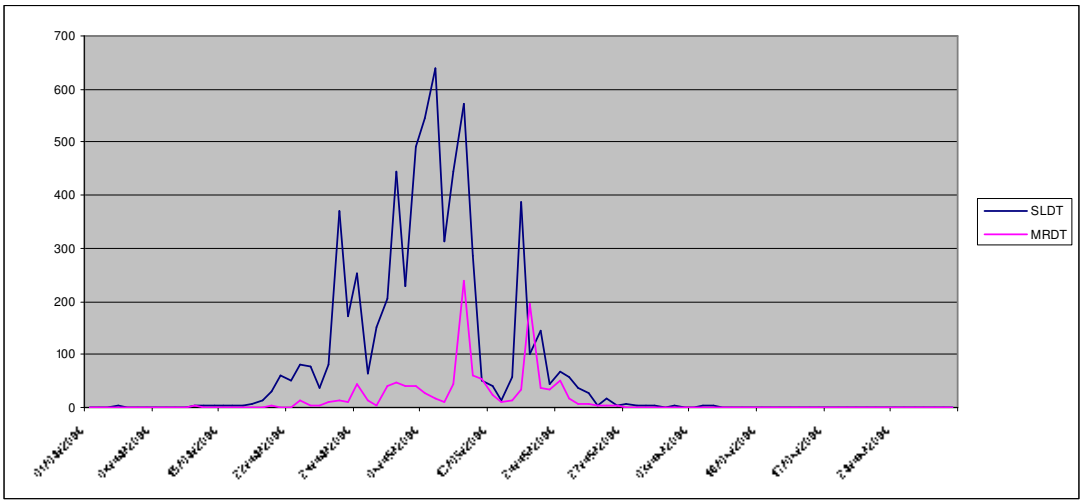


Figure 4.1. Timing of the 2006 wild salmon smolt run in the Salmon Leap & Mill Race traps.

Table 4.9. Numbers of wild salmon smolts counted in 2006.

MONTH	SLDT	MRDT	TOTAL
March	0	1	0
April	1323	123	2602
May	5396	1063	6513
June	10	2	184
TOTAL	6729	1189	7918

Table 4.10. Annual numbers of wild salmon smolt recorded in downstream traps and the number released downstream

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Count	6148	6331	9588	7197	5791	6466	8627	7248	9316	7261	7918
Released	5854	5960	8937	7118	5689	6387	8423	7081	9121	7030	7701

4.7 Wild Salmon Kelts

The wild kelt run commenced in December 2005 and the peak of the run occurred during March 2006, when 52.5% of the total run was recorded. (Table 4.11).

The survival from the spawning stock decreased slightly from 57.6% in 2005 to 54.4%.

Table 4.11. Numbers of wild salmon kelts counted in 2006.

	SLDT	MRDT	TOTAL
Dec '05	5	3	8
January '06	22	7	29
February	43	1	44
March	125	10	135
April	37	1	38
May	2	1	3
Total	234	23	257

Table 4.12. Comparison of annual kelt runs:

	A	B	C	D	E
1975-79	75	18	14.0	30.0	8.1
1980-84	82	18	6.7	48.7	9.7
1985	94	26	3.0	56.0	7.7
1986	93	31	3.4	55.3	9.2
1987	68	15	10.8	22.6	9.7
1988	88	24	4.6	55.0	8.7
1989	96	11	3.7	27.0	6.6
1990	94	35	5.6	48.6	7.6
1991	98	39	3.4	82.3	9.7
1992	92	39	7.0	59.3	6.9
1993	83	5	3.2	52.7	7.4
1994	91	37	4.7	64.3	1.6
1995	74	28	18.3	59.9	2.3
1996	88.1	27	10.1	53.1	4.0
1997	93.7	33.5	6.3	58.9	*
1998	94.3	30.8	5.7	67.6	*
1999	90.6	38.5	4.5	76.0	*
2000	92.5	44.5	5.5	62.1	*
2001	97.0	38.5	2.8	72.5	*
2002	91.3	40.9	7.8	49.6	*
2003	95.5	37.0	3.5	42.3	*
2004	89.9	36.3	9.0	53.2	*
2005	83.3	35.5	15.3	57.6	*
2006	82.2	36.1	16.0	54.4	*

A = % healthy kelts in kelt run
B = % males in kelt run
C = % lightly marked
D = % survival from wild spawning escapement
E = % recapture of previously spawned grilse in first year

5. REARED SALMON CENSUS PROGRAMME

5.1 Coastal Returns

Details of coastal returns of Burrishoole fish are available in the Marine Institute 'National Report for Ireland - The 2006 Salmon Season' report.

5.2 Return rate of reared and wild grilse

During 2006 a total of 755 microtags were retrieved from the traps and rod fishery and consisted of 23 microtag codes. A total of 406 tags were identified as core release groups from the release of 20,945 smolts released as part of the ongoing ranching programme. This represents a return rate to freshwater of 1.9%.

In addition a total of 60 fish were identified from a release of 3,258 precocious parr in 2005 which represents a return rate from this group of 1.8%.

5.3 Recapture of Reared 2SW Fish

The total number of microtagged 2 SW reared fish recorded in Burrishoole during 2006 was 80. They consisted of 7 Burrishoole core, 25 Burrishoole experimental and 48 Shannon stock ranched from Burrishoole.

5.4 Smolt Releases 2006

A total of 27,273 ranched smolts were released from Burrishoole during 2006. They consisted of 13,236 core Burrishoole smolts and 14,037 Burrishoole smolts released for experimental purposes. The core release groups were released as two groups into Lough Furnace, one on 26th April and the second group on the 4th May.

In addition to the above core release of Burrishoole smolts, an experimental group of 30,096 freeze branded salmon smolts derived from Burrishoole wild, ranched and non native crosses were released into Lough Furnace on 26th April 2006. For further information on all experimental groups see Section 3.1.1.

A total of 7,989 Burrishoole smolts were transferred to the river Barrow on the east coast and released on 6th April.

Burrishoole smolts released in 2006 :

Group ID	Tag code	Mean wt/(g)	Mean lt (cm)	No. released	Rel. date
Marical	24781	57.7	17.2	4979	26/04/2006
SLICE	24782	64.1	17.6	5024	26/04/2006
Core	14782/14764	59.8	17.3	4988	26/04/2006
Core	24791	72.7	18.6	8248	04/05/2006
SLICE	24783	76.1	18.8	4034	04/05/2006
Barrow	24786	51.5	16.3	7989	06/04/2006

6 WILD SEA TROUT CENSUS PROGRAMME

The sea trout research and monitoring programmes were continued in 2006. A similar problem with unknown upstream trout escaping through the traps may have occurred – See Chapter 4.

6.1 Upstream Movements: Timing and Numbers

A total of 38 wild silvered sea trout and a further 61 non-silvered trout migrated upstream through the traps in 2006. Of the silvered trout, 2 were adults and 36 (95%) were finnock. The numbers are compared with other years in Table 6.1. Of the total run of migratory trout (99), 62% were non-silvered. For the purposes of this report, the non-silvered trout are not included with the sea trout. Table 6.1 shows clearly that the numbers of sea trout have not recovered in the Burrishoole system and have shown a ten-fold drop since the 1970s. The sea trout count for 2006 was the 2nd lowest ever recorded.

Table 6.1. Annual runs of sea trout recorded in the traps.

YEAR	MILL RACE	SALMON LEAP	TOTAL	Amended Total
1970-74	1365	762	2127	
1975-79	829	1775	2604	
1980-84	458	780	1238	1719 *
1985-89	386	590	978	
1990-94	134	72	206	
1995-99	86	91	177	
1985	479	976	1465	
1986	277	1110	1387	
1987	528	422	950	
1988	497	366	863	
1989	147	77	225	
1990	101	54	155	
1991	180	162	342	
1992	123	28	151	
1993	130	43	173	
1994	136	74	210	
1995	90	90	180	
1996	112	85	197	
1997	65	72	137	
1998	56	50	106	
1999	107	157	264	
2000	33	78	111	
2001	31	58	89	
2002	26	89	115	
2003	45	33	78	
2004	26	64	90	
2005	5	10	15	
2006	16	22	38	

* See Table 34, Ann. Rep. XXX (1985); p. 43.

The timing of the sea trout run in 2006, and in previous years, expressed in monthly percentages, is given in Table 6.2. The highest proportion of sea trout, both finnock and adults, moved upstream in August, September and October probably reflecting the zero sea age nature of the run. The brown trout moved upstream throughout the period with a peak in October.

Table 6.2. Timing of the Burrishoole sea trout run (in monthly percentages). (n = no. of sea trout).

	1970-'79	1980-'84	1985-'89	1990-'94	1995-'99	2000-'04 (483)	2005 (15)	2006 (38)	Unsilvered trout 2005 (86)	Unsilvered trout 2006 (61)
May	-	0.2	0.5	0.1	3.1	2.0	6.7	0.0	4.7	16.4
June	13.1	24.6	9.4	8.4	8.6	16.7	26.7	0.0	10.5	9.8
July	54.4	44.9	62.2	55.0	42.4	37.5	0.0	10.5	4.7	16.4
August	15.8	10.3	18.4	16.5	19.3	26.4	60.0	26.3	43.0	11.5
September	7.6	14.8	3.7	8.5	9.8	5.7	6.7	44.7	12.8	13.1
October	6.4	3.5	4.1	7.9	12.2	10.2	0.0	15.8	9.3	27.9
November	2.4	1.5	1.5	2.9	4.3	1.5	0.0	2.6	10.5	3.3
December	0.3	0.2	0.2	0.7	0.7	0.0	0.0	0.0	4.7	1.6

6.2 Spawning Escapement

With the continuation of the catch and release bye-law into the 2006 fishing season and the closure of L. Feeagh to angling, no sea trout were reported killed by anglers on L. Feeagh in 2006. Using the upstream fish counts through the traps, the total maximum spawning escapement of migratory trout to the L. Feeagh catchment was 99, of which 61 were non-silvered sea trout.

Table 6.3. Annual spawning escapement of sea trout into freshwater.

	1970-'79	1980-'84	1985-'89	1990-'94	1995-'99	2000-'04	2005	2006
Max. Escap	2090	1146	906	231	289	156	101	99
Revised		1622						

6.3 Downstream Movements, Sea Trout Smolts

The 2006 smolt run amounted to 628 smolts, of which 626 were released to the wild (Table 6.4). Few smolts were recorded from January to March. The main migration occurred in April and May and was strongly regulated by water level (Fig. 6.1). The 2006 smolt run continued the trend of low numbers of smolts (Table 6.5).

Table 6.4. Monthly numbers of Burrishoole sea trout smolts recorded through the traps.

	Salmon Leap	Mill Race	Total	%
January	0	0	0	0.0
February	0	0	0	0.0
March	12	3	15	2.4
April	226	5	231	36.8
May	351	28	379	60.4
June	3	0	3	0.5
July	0	0	0	0.0
Total	592	36	628	
Number Released Downstream			626	

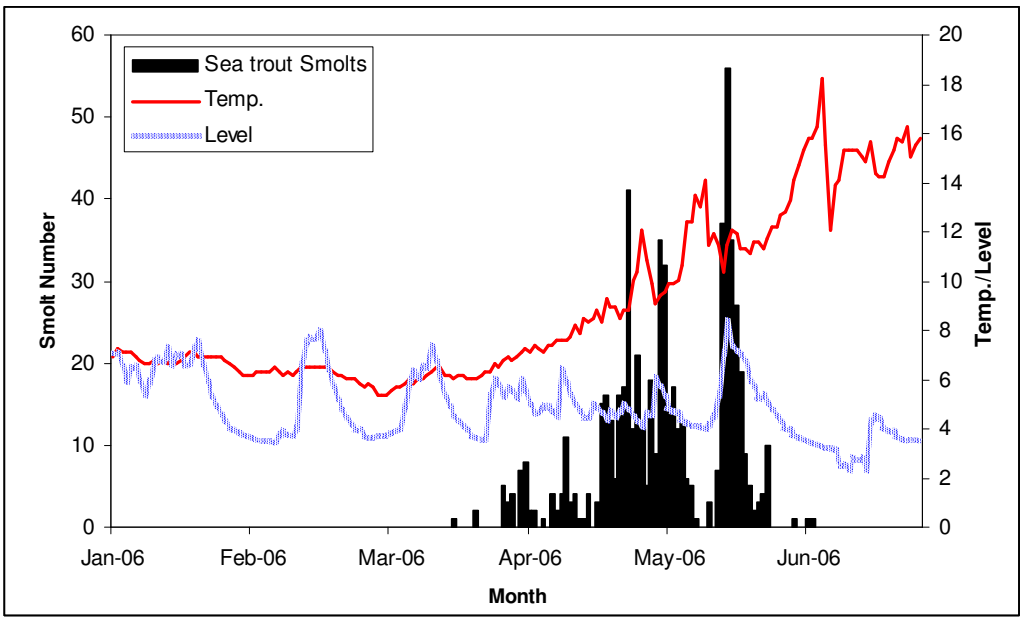


Fig. 6.1. Timing of the 2006 wild sea trout smolt migration with daily water level (m x 10) and temperature (^{0}C).

Table 6.5. Annual sea trout smolt numbers in Burrishoole for 1970 to 2006.

	1970-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005	2006
Number	4176	4038	4119	1531	1361	816	777	626

A total of 158 wild smolts were measured in 2006. Length measurements were taken to facilitate an estimated age breakdown of the smolt run. The estimated statistics for the 2006 smolts were, mean length of 21.1 cm and a range from 14.6 to 29.8 cm and the length frequency is presented in Figure 6.2. This gave an estimated age of 59.1% 2 year old and 40.9% 3 year olds.

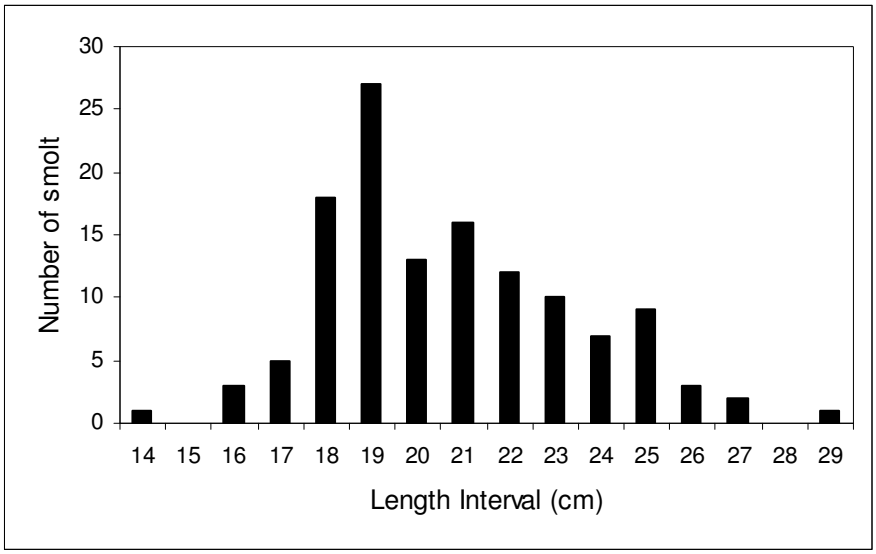


Fig. 6.2. Length distribution for smolts in the Burrishoole system, 2006 (n=158).

6.4 Autumn Migrating Smolts

These are juvenile trout (*Salmo trutta* L.) which generally move downstream through the traps from August to December. It is not clear whether these are true sea trout or part of the resident trout stock, should a difference exist. These runs of trout would appear to becoming more prolonged with substantial numbers of un-silvered 0+ and 1+ trout continuing to migrate downstream in the early months of the year.
A total of 773 trout entered the traps between July and December 2006 and up to May 2007 (Table 6.6) – almost double that of 2005. The percentage of 0+ trout that migrated over the period was 51.2% (Table 6.7).

Table 6.6. Numbers of migrating autumn juvenile trout in 2006, to the end of May 2007.

Month	0+ SL	0+ MR	1+ SL	1+ MR	Total SL	Total MR
July	0	0	2	0	2	0
August	3	0	1	0	4	0
September	128	8	89	4	217	12
October	109	5	65	8	174	13
November	35	1	48	3	83	4
December	24	2	55	0	79	2
January 2007	50	2	58	3	108	5
February 2007	14	0	11	0	25	0
March 2007	13	0	18	1	31	1
April 2007	1	0	3	1	4	1
May 2007	1	0	4	3	5	3
Total	378	18	354	23	732	41
Overall Total	396		377		773	

Table 6.7. Percentage of 0+ juvenile trout amongst trapped autumn migrating trout.

1982	50.0	1995	25.3
1983	N/A	1996	34.0
1984	55.8	1997	18.7
1985	30.3	1998	33.5
1986	16.1	1999	42.0
1987	35.3	2000	47.8
1988	60.9	2001	56.3
1989	37.2	2002	32.8
1990	35.2	2003	48.9
1991	26.0	2004	35.5
1992	38.2	2005	37.3
1993	27.6	2006	51.2
1994	16.8		

6.5 Total Recruitment

The 0+ autumn trout will not be large enough to become sea trout smolts in the following spring. The remainder, predominantly 1+ years old, could contribute to the overall recruitment of sea-run trout the following year. The exact proportion of 1+ autumn trout that become smolts in any given year is not known.

It is only since 1982 that the proportion of 0+ trout amongst the autumn migration has been estimated. Thus the figures for total recruitment up to this time are over-estimated (Table 6.8).

From 1982, total recruitment was calculated by adding the number of sea trout smolts produced in any one year to the total of 1+ autumn trout the previous year (Table 6.9). The assumption is made that all the 1+ autumn trout will become sea trout smolts and that no 0+ trout from the two years previous will be recruited as smolts. The fate of 1+ unsilvered juveniles migrating downstream in January to May is unknown but it would seem unlikely that these will contribute to the 2 year old spring smolt migration.

Table 6.8. Estimates of total migrant trout recruitment up to 1981.

YEAR	SMOLT TOTAL	AUTUMN TROUT (preceding year)	TOTAL RECRUITMENT
1970-74	4450	2870	6746
1975-79	4314	3186	7489
1980	2337	2351	4688
1981	6710	2631	9341

Table 6.9. Estimates of total migrant trout recruitment from 1982.

YEAR	SMOLT TOTAL	AUTUMN TROUT 1+ & Older (preceding year)	TOTAL RECRUITMENT
1982	3907	1300*	5207*
1983	4852	1109	5961
1984	2383	1200*	3583*
1985	4238	611	4894
1986	3454	1472	4926
1987	3371	1726	5097
1988	4290	949	5239
1989	3179	556	3735
1990	2022	634*	2656*
1991	2137	636	2773
1992	1936	234	2170
1993	1720	183	1903
1994	1127	306	1433
1995	1821	282	2103
1996	1300	336	1636
1997	817	513	1330
1998	1608	717	2325
1999	1260	644	1904
2000	769	358	1127
2001	530	218	748
2002	1272	910	2100
2003	787	976	1763
2004	723	426	1149
2005	777	590	1367
2006	628	251	879

* estimated

6.6 Marine Survival

An estimate of sea trout survival to first return to freshwater can be more accurately calculated by the use of trap census data rather than rod catch returns of tagged or marked fish. Small numbers of stray fish are captured in other systems and it is not known whether these fish would have returned to their natal systems to spawn. Finnock are known to wander between river systems and are therefore not as reliable for assessing survival.

The pattern of marine survival found is similar whether the number of smolts is used or the combined total recruitment of smolts and autumn 1+ trout. The percentage of smolts that return as finnock in the same year historically ranged from 11.4% to 32.4% (Fig. 6.3). In 1988 it fell below the previous recorded minimum to 8.5% and in 1989 to a minimum of 1.5%. There has been a saw-tooth pattern of finnock return in the 1990's rising to 16.7% in 1999 – the highest return rate since 1986. This increase was not, however, sustained in

subsequent years and there was a collapse in 2005 down to 1.5%. This was associated with the heaviest infestations of sea lice observed in the Burrishoole area since 1992.

The total survival of smolts to the first return to freshwater as finnock in the same year and one year old sea trout in the following year (always an over-estimate as a proportion of finnock re-entering freshwater in year 1 return as sea trout in year 2 (Mills *et al*, 1990)) also shows a drop in survival from 1987 to 1989 (Fig. 6.4).

Historically, the total survival to first return ranged from 19% to 66%. This collapsed to 1.8% in 1989 but rose to 12.1% in 1990. However, little further improvement was recorded in 1991 (12.8%). Marine survival fell to the second lowest level in 1992 but returned to 13.1% for the 1993 year class of smolts. There was a further increase in 1994 to 18.2% but a drop in 1995 to 8.1%. There were marginal improvements again in 1996 (12.8%) and 1997 (13.3%), a drop to 8.3% in the 1998 year class and a marked improvement in the 1999 year class where marine survival was 20%, the highest recorded in 12 years and within the pre-collapse historical range.

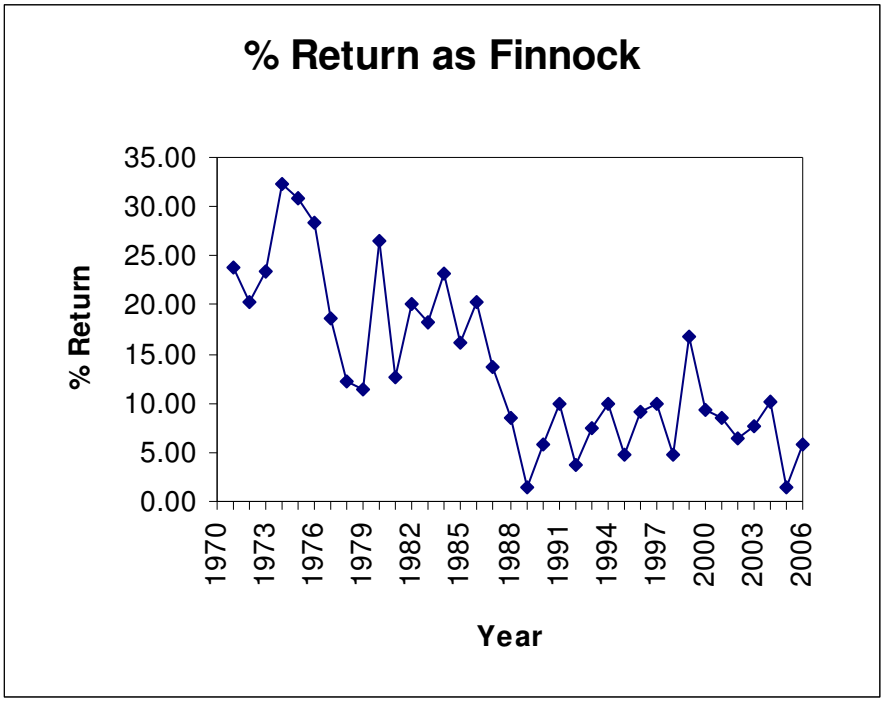


Fig. 6.3. Annual percentage return of smolts returning as finnock to the Burrishoole system.

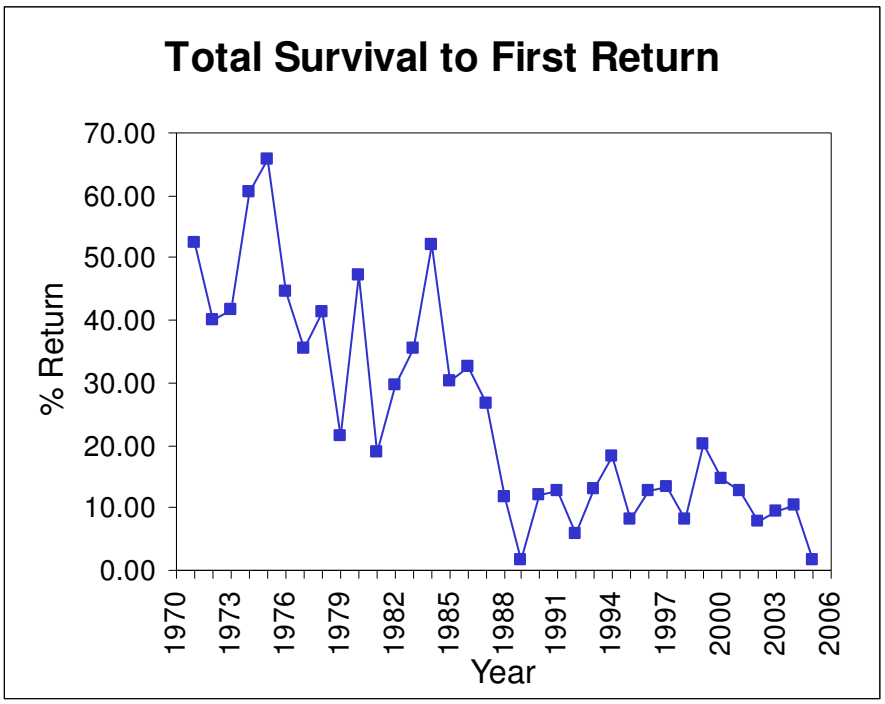


Fig. 6.4. Annual marine survival of smolts to first return (as finnock and 1+ sea trout) to the Burrishoole system.

6.7 Sea Trout Kelts

Table 6.10 gives the numbers of sea trout and brown trout kelts, both spawned and immature, counted downstream in the winter of 2005 and spring of 2006.

The freshwater survival of kelts is given in Table 6.11. In some years, the number of kelts migrating downstream has exceeded the number of upstream migrants. This occurred in the early '80s when the screen allowed finnock to escape. This was rectified. More recently, the difficulty in separating small finnock and large smolts has led once again to a discrepancy as shown in Table 15. In addition to the size overlap, trout counted upstream as unsilvered migrants may be counted downstream as silvered kelts, causing difficulties in making survival estimates.

Since 1987, only one survival rate has been given for all sizes as it has been shown that a proportion (at least 33%) of the sea trout population may over-winter in freshwater. These fish do not spawn and continue to grow. There is also the additional complication of larger smolts and reduced sea growth mentioned above. Thus the comparisons of the proportion of fish in different year classes between the upstream migrants of one year and the downstream migrants of the next are invalidated.

Table 6.10. Timing and numbers of sea trout kelts for the 2005/2006 season.

Month	Large ST	Small ST	BT	Total ST	Total Trout
October '05	0	2	5	2	7
November	2	7	23	9	32
December	1	0	33	1	34
January '06	4	1	8	5	13
February	0	0	6	0	6
March	2	7	13	9	22
April	6	9	1	15	16
May	0	1	4	1	5
June	0	0	0	0	0
Total	15	27	93	42	135

Table 6.11. Annual survival rate to sea trout kelt, as % of the upstream escapement of the previous year.

Year	Larger (> 30.0 cm)	Small (< 30.0 cm)
1976	79	66
1977	63	45
1978	50	66
1979	33	107*
1980	50	82
1981	44	345*
1982	53	203*
1983	63	177*
1984	74	210*
1985	70	98
1986	66	72
1987	58.7% (combined)	
1988	65.5%	"
1989	68.7%	"
1990	79.0%	" *
1991	98.7%	" *
1992	89.5%	" *
1993	96.7%	" *
1994	104.6%	" *
1995	96.2%	" *
1996	127.7%	" *
1997	97.0%	" *
1998	140.1%	" *
1999	110.4%	" *
2000	70.1%	"
2001	82.0%	" *
2002	129.6%	" *
2003	66.1%	"
2004	120.5%	"*
2005	142.2%	"*
2006	110.5%	"

* Years when the number of finnock kelts counted downstream exceeded the number counted upstream during the previous season.

7 SILVER EEL CENSUS PROGRAMME

Silver eel trapping was continued in 2006. The main run occurred in September and October (Table 7.1). Figure 7.1 shows the daily counts of silver eels in relation to changes in water level. The main runs of eels were closely related to increases in level and also coincided with the darker lunar phases.

The total run amounted to 2163 eels. As in other years, the highest proportion of the total catch (83%) was made in the Salmon Leap trap.

Table 7.1. Timing and numbers of the 2006 silver eel run.

	Salmon Leap	Mill Race	Total	%
June	2	1	3	0.1
July	13	0	13	0.6
August	50	10	60	2.8
September	554	174	728	33.7
October	917	149	1066	49.3
November	243	31	274	12.7
December	16	1	17	0.8
Jan. 2007	1	1	2	0.1
Total	1796	367	2163	

Sampling of individual eels (n = 493) gave an average length of 48.0 cm (range: 29.5 – 87.6 cm) and an average weight of 225 g (Table 7.2). The length frequency distribution is presented in Figure 7.2 along with that for 2005 for comparison.

Catches of silver eel between the years 1971 (when records began) and 1982 averaged 4,400, fell to 2,200 between 1983 and 1989 and increased again to above 3,000 in the '90s (Fig. 7.3). There was an above average catch in 1995, possibly contributed to by the exceptionally warm summer. The catch in 2001 of 3875 eel was the second highest recorded since 1982. The average weight of the eels in the catches has been steadily increasing from 95 g in the early 1970s to 215 g in the 1990s (Fig. 7.3).

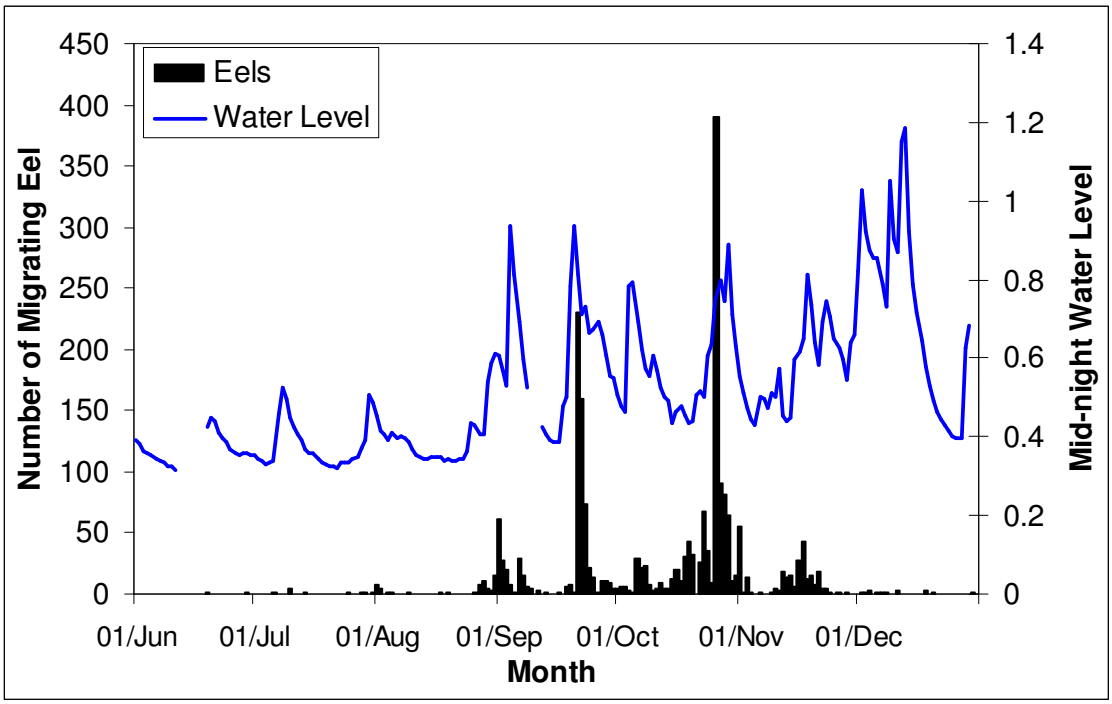


Fig. 7.1. Daily counts of downstream migrating silver eel and mid-night water levels.

Table 7.2. Comparative data for the silver eel runs since 1971

Years	Number Sampled	Mean. Weight (gm)
1971 - '75	4465	84
1976 - '80	4023	115
1981 - '85	2678	171
1986 - '90	11658	196
1986	1856	194
1987	2713	195
1988	3283	206
1989 *	685	254
1990	3121	176
1991	266	246
1992	523	186
1993	181	260
1994	468	220
1995	2003	225
1996	1172	184
1997	1022	238
1998	845	208
1999	577	220
2000	342	212
2001	850	238
2002	732	207
2003	650	177
2004	382	216
2005	587	237
2006	493	225

* Incomplete due to flood damage

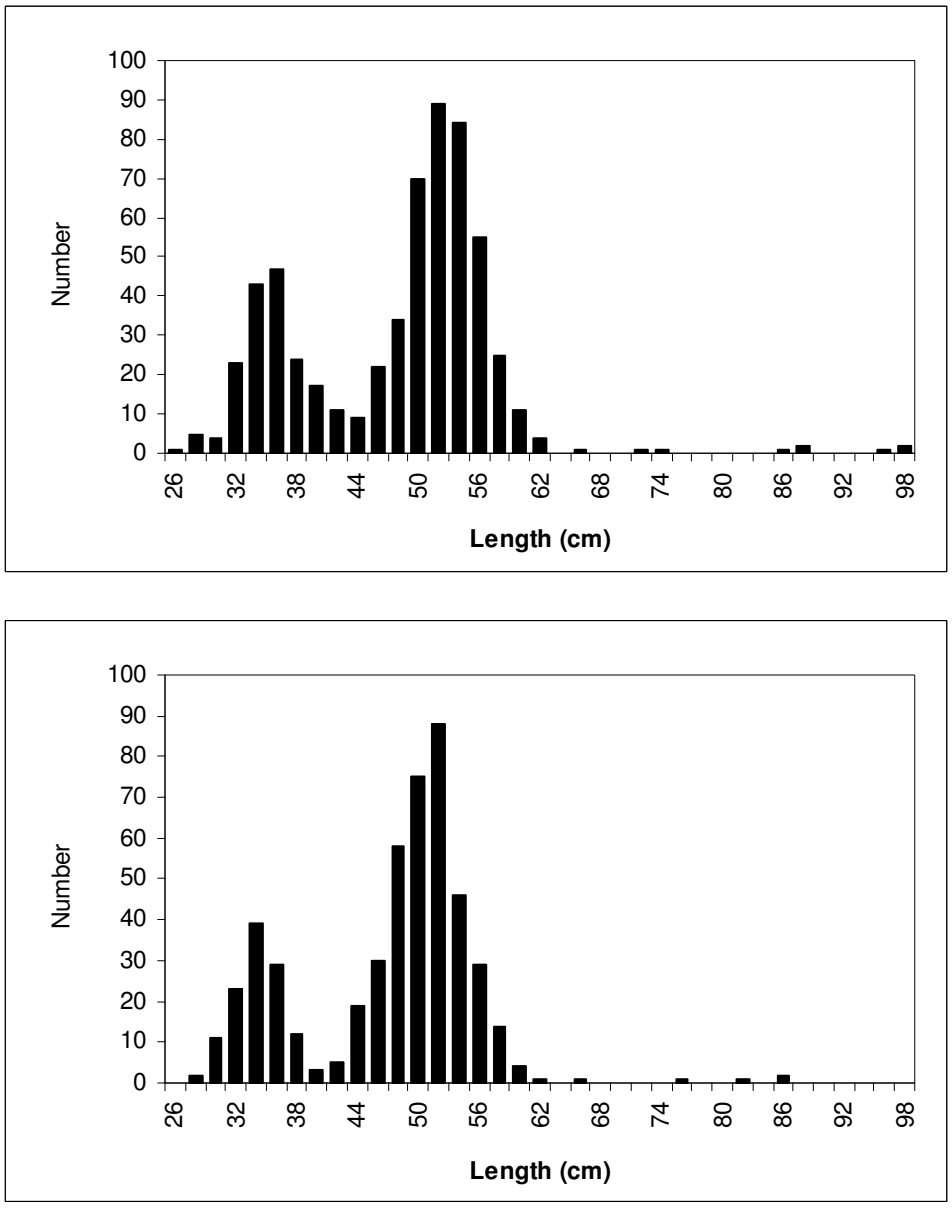


Fig. 7.2. Length frequency of silver eels sub-sampled in the downstream traps, 2005 (n=587) and 2006 (n=493).

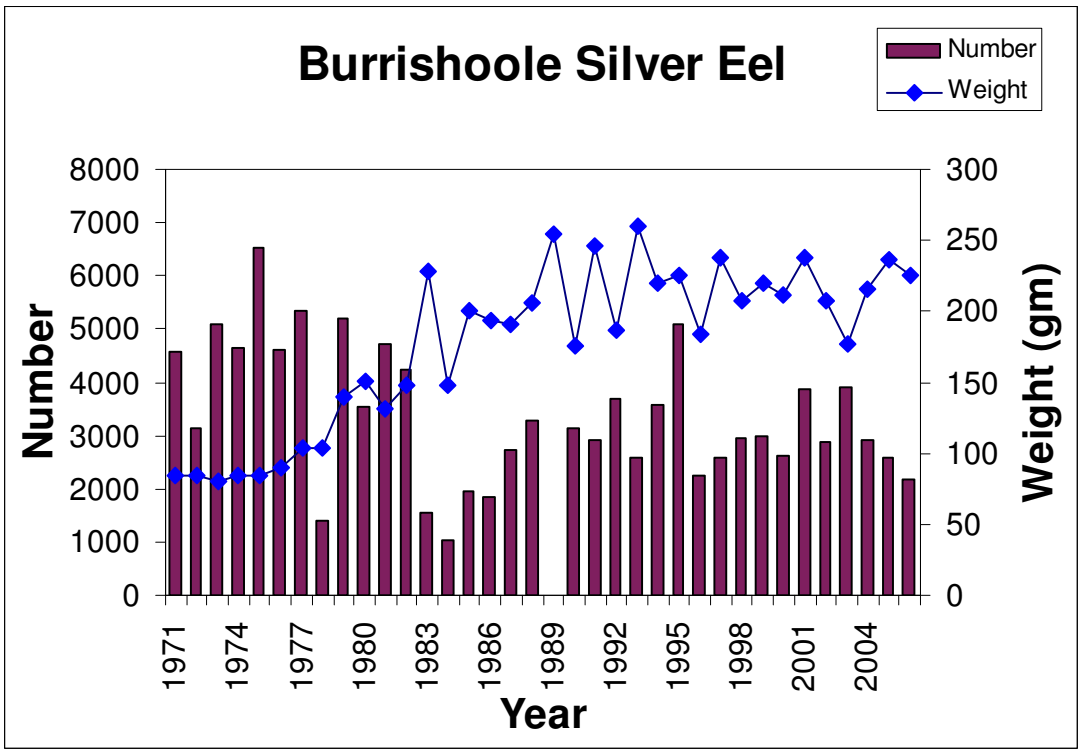


Fig. 7.3. Annual number and mean weight of silver eels trapped in the downstream traps.

8 FISHERY REPORT - CATCH DATA

8.1 Numbers and Average weight of Rod Catch

A total of 114 salmon were caught in the Burrishoole Fishery in 2006. The catch consisted of 66 reared fish and 48 wild fish. For conservation purposes 43 of the wild fish were returned alive.

The average weight of reared fish was 1.6 kg (n=64); the heaviest reared fish 4.0 kg. No lengths or weights are available for wild fish.

The total trout rod catch was 11 fish. Regulations remained in place whereby all rod caught sea trout were returned alive.

8.2 Timing of Catch and Rod Effort

Angling was again confined to Lough Furnace during 2006, as Lough Feeagh remained closed as a conservation measure.

Despite the fact that the rod effort in both June and July was greater in 2005 than in 2006 the overall number of rod days increased from 208-rod days during 2005 to 258 in 2006. This was a result of an increase in rod effort in both August and September from the previous year. This was a direct result of fish arriving into Lough Furnace later than usual. This late arrival of fish was reflected in the upstream traps where 1.4% of the total wild was recorded in June compared to 23.9% the previous year.

The overall salmon catch increased 55 in 2005 to 114 in 2006. The wild catch increased from 27 fish to 48 fish and the reared catch from 28 to 66 fish.

Table 8.1. Wild and reared salmon rod catch and rod effort (hours) for the 2006 season.

	SALMON CATCH		EFFORT/ HRS.
	WILD	REARED	
May	0	0	0
June	8	7	212
July	16	22	790
August	24	35	813
September	2	2	252
Total	48	66	2067

8.3 Exploitation Rates of Rod Fishery

Rod exploitation rates for Lough Furnace and Lough Feeagh from 1990 to 1996 are shown in Table 34. From 1997 onwards Lough Feeagh was closed to angling. Exploitation rates are only available for Lough Furnace for these years. The cessation of angling on Lough Feeagh was due to the continuing low stock level of wild fish.

Anglers fishing on Lough Furnace were requested to return wild fish alive to the water. Injured wild fish were permitted to be retained; therefore the rod catch on Lough Furnace consists of a total catch which includes released fish and a retained catch which are fish that have been killed.

Table 8.2. Rod Fishing Exploitation Rates (2000-2006) – revised 2006 fish counts in parentheses.

	2000	2001	2002	2003	2004	2005	2006
WILD SALMON							
Lough Feeagh							
"Available" fish by end of fishing season	*	*	*	*	*	*	*
Total rod catch							
Rod catch retained							
Angling success %[1]							
Exploitation rate %[2]							
WILD SALMON							
Loughs Feeagh & Furnace							
Total stock of wild fish	580	375	651	565	610	542	400 (566)
+ 10% addition for L. Furnace population	638	413	716	622	671	596	440 (623)
Total catch of wild fish	70	17	12	37	10	27	48
Rod catch retained	6	1	1	3	2	1	5
Max. angling success %	12.1	4.5	1.8	6.5	1.6	5.0	12.0 (8.5)
Min. exploitation rate	0.9	0.2	0.14	0.5	0.3	0.2	1.1 (0.9)
Max. exploitation rate	1.0	0.3	0.15	0.5	0.3	0.2	1.3 (0.8)
REARED SALMON	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Lough Feeagh							
"Available" fish by end of fishing season	*	*	*	*	*	*	*
Rod catch							
Exploitation rate %							
Loughs Feeagh & Furnace							
Total stock	1257	834	860	1178	902	952	773 (954)
Total rod catch	129	43	10	22	64	28	66
Exploitation rate %	10.3	5.2	1.2	1.9	7.1	2.9	8.5 (6.9)
WILD SEA TROUT							
Lough Feeagh "Available" fish by end of fishing season	*	*	*	*	*	*	*
Rod catch							
Exploitation rate %							

* No Fishing on Feeagh

8.4 Angling Success

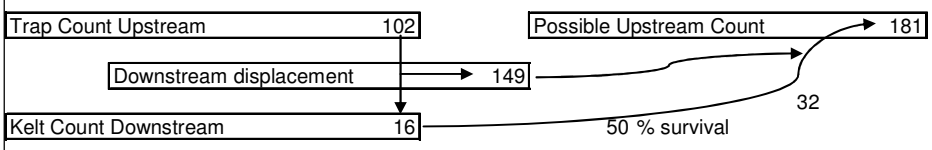
The increased rod catch of both wild and reared salmon in 2006 may have been a result of the increased availability, particularly in relation to wild fish, on Lough Furnace. This was a result of the low water conditions during much of the fishing season reducing access for wild fish to Lough Feeagh.

Table 35. Catch per unit effort (CPUE) and effort per unit catch (EPUC) for the Burrishoole Fishery

YEAR	L. FURNACE				L. FEEAGH			
	SALMON		SEA TROUT		SALMON		SEA TROUT	
	CPUE	EPUC	CPUE	EPUC	CPUE	EPUC	CPUE	EPUC
'80-'84	0.13	9.92	0.85	1.35	0.23	4.47	0.63	2.10
'85-'89	0.24	4.89	0.46	5.09	0.24	4.57	0.29	70.30
'90-'95	0.20	6.10	0.17	16.80	0.20	5.40	0.10	14.00
'96	0.22	4.4	0.10	10.5	0.83	1.20	0.30	2.90
'97	0.17	6.0	0.10	9.6	-----	-----	-----	---
'98	0.44	2.3	0.08	13.2	-----	-----	-----	---
'99	0.09	10.8	0.05	20.8	-----	-----	-----	---
'00	0.30	3.31	0.06	16.5	-----	-----	-----	---
‘01	0.15	6.7	0.12	8.4	-----	-----	-----	---
’02	0.12	8.3	0.07	15.3	-----	-----	-----	---
’03	0.13	7.6	0.06	17.7	-----	-----	-----	---
’04	0.22	4.6	0.16	6.3	-----	-----	-----	---
’05	0.26	3.8	0.08	13.0	-----	-----	-----	---
’06	0.44	2.3	0.04	23.5	-----	-----	-----	----

Annex: Revised figures for upstream trap counts, 2006. Scenario 3 was used for the updates.

Reared Return **2006**



therefore: 102 is 56.4% of estimated upstream run.

Wild Grilse Return

Assuming the problem was in the Mill Race Trap/fence

1. Estimate Based on Equivalent escape compared to reared fish

56 WG in MR & 308 in the SL = 364 | 2007 Kelt count = 271

56 raised by RG estimated % = 99 estimated WG MR count

99 WG in MR & 308 in the SL = 407 less lost 31 = 376 Sp. Stck

Kelt survival of Sp. Stck = 72.0% Too High?

2. Worst Case Scenario Based on Whole Run raised similar to reared fish

56 WG in MR & 308 in the SL = 364

364 raised by RG estimated % = 646 estimated WG MR count

Therefore the Total estimated WG count = 646 less lost 31 = 615 Sp. Stck

Kelt survival of Sp. Stck = 44.1% Too Low?

3. Scenario based on Average survival to Kelt

Average survival to kelt = 51.1% for 2001-2005

therefore: 271 = Sp. Stck of : 530 plus 31 = run of 561 inc. spring fish

grilse of 530

4. Scenario based on smolt return to trap

2005 Smolt Count = 7030

Upstream Count = 364 plus 5 Furnace rod = return 369

Actual Count	Percent Return	5.2%	-2.2% diff from average
Scenario 1	Percent Return	5.9%	-1.5%
Scenario 2	Percent Return	9.3%	1.9%
Scenario 3	Percent Return	7.5%	0.1%

Average 5 year return for smolt = 7.4% for 2001-2005